

## New Scientist and Greenpeace Science Debates

### Science, technology and our future: the big questions

#### Can Science be directed?

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Part of our agenda this evening is the widening gap between the way the world is and the way the world could be if the benefits of science were optimally channelled. The benefits are actually distributed unfairly for many of the world's people. They are outweighed by looming environmental threats and biotechnology, though it has amazing potential, has a nightmarish downside as well.

But before looking forward I would like to contrast our present concerns with those of the mid 20<sup>th</sup> century. The science that then loomed largest was physics, especially nuclear physics. The agenda is now far broader dominated by environmental and biomedical issues. Moreover there is another big change since the 1950s; pivotal decisions on nuclear weapons and nuclear power were then made with a quite indefensible degree of secrecy. There is still a long way to go before policy making is as open as it should be but there is a gratifying opening up that has taken place since the 50s and 60s. At that time government scientists were perhaps unthinkingly

fuelling the arms race. Solly Zuckerman writing with the wisdom of hindsight and old age wrote "Most innovations came from scientists in the weapons labs. The military were then persuaded that these innovations were needed and the arms race ratcheted up an extra notch leaving both sides less secure than before."

But in the Cold War era, some nuclear scientists who had worked at Los Alamos set a fine example, those like Joseph Rotblatt who set up the Pugwash conferences. They didn't say they were just scientists doing their job and that use made of their work was up to politicians. They campaigned forcefully for nuclear arms control and I think these scientists should be our model today.

We think it odd if parents don't care what happens to their children even if it beyond their control. Likewise even the purest, curiosity-driven scientists should care what happens to their work. They should welcome benign applications of their ideas and warn against and resist dangerous or threatening spin-offs.

All policy decisions with a scientific dimension should be the outcome of a broad debate but this debate won't rise above the level of tabloid sloganizing without an informed public and scientists can help to ensure this. If they have special interests or potential biases this should be declared so we can apply an appropriate correction factor to what they say. But they are all expert witnesses, as it were, and should be engaged in dialogue with the wider public emphasising the risks and uncertainties as well as what we have learnt. But in the actual decisions scientists views, of course, carry no special weight.

Indeed the main impediment to spreading the benefits of science are economic and political. In our grossly unequal world it is more profitable to provide luxuries for the rich than necessities for the poor. What is required here is not more science but either drastic redistribution or governmental subsidies or some other social science innovation.

What about the downsides and risks of new science and technology? This is not an anti-science question. In fact, those who are best informed about science tend to be most concerned about the potential dangers there are surely many potential applications human cloning, GMOs, and the rest where regulation and control will be called for. Some people would accept the need to control or redirect the applications of science but claim nonetheless that pure research should be left untrammelled. But that's simplistic. There is no sharp demarcation between the two. Science is moulded by technology and society just as much as vice versa. Let me take examples just from academic fields that I am involved in. Huge accelerators used by particle physicists wouldn't have been funded had not physicists achieved a lot of governmental clout after the WW2. Detectors for faint radiation used by astronomy were devised first for the military and now for consumer electronics. And space science rides along on a huge programme driven by super-power rivalry in the Cold War era. Because of extraneous factors like this, and you could come up with a similar list in other scientific fields, the deployment of effort and resources along the scientific frontiers is sub-optimal. Some areas deserve more encouragement and effort; environmental researchers, tropical diseases, renewable energy sources, bio-diversity studies and so forth. I think we'd all agree.

But I want to broach a more controversial issue. Are there areas of academic research --the kind of science done in university laboratories--that the wider public should try to hold back? To some extent the answer is yes; yes, if the work involves experiments on humans or animals to which there are ethical objections, or if the experiments seem repulsive to most of us. The Yuk factor, as Brian Appleyard termed it. And yes, if the experiments themselves pose a risk, dangerous pathogens that might escape, or physicists probing unknown extremes of energy. But what if the experiments seems OK but it seems as if the outcome will realistically be mischievously and damaging applied. I personally think that the answer is 'Yes' here too, just as a field of pure science merits enhanced strategic funding if foresight exercises suggests it might have promising spin-off, so we might perhaps direct funds away from a field which although interesting might lead to problematic

applications. Of course, such decisions couldn't stop a line of research. They could merely decelerate it as you can't control scientists thoughts or speculations, nor how private benefactors chose to use their resources.

I have emphasised that scientists shouldn't carry more weight than other citizens in decisions on how science is applied but there are some issues, one in particular, where specialists should be heeded. They are much the best placed to judge whether a problem is soluble. Some scientific problems are obviously important but not yet ripe for a frontal attack. It is no good throwing money at them. Nixon's "war on cancer" was premature. Untargeted fundamental research was a better bet. Indeed one lesson of the past is that unchanneled curiosity can engender colossal pay-offs that are quite unpredictable. In the 19<sup>th</sup> century X-rays weren't the outcome of a crash medical programme to see through flesh, but an accidental discovery by a physicist. And most 20<sup>th</sup> century technology is the outcome of research pursued for motives of curiosity. That's incidentally why foresight exercises could have a downside if they put a kind of funding blight on everything that isn't highlighted.

I want to close with a pessimistic thought. 21<sup>st</sup> century technology confronts us with many depressing prospects nuclear proliferation, environmental degradation and so forth, but one in particular gives me nightmares. It's what might happen when thousands even millions of individuals have the technical capability to work in biotechnology. Devastation could then be caused by a single fanatic or a weirdo with the mindset of the kind of people who now design computer viruses, even by somebody who is merely incompetent rather than malign. And there are other threats that are growing like bio-terrorism. Even if all nations impose strict controls the chances of effective enforcement world-wide are no better than in the case of the drug laws given that even a single infringement by one person could trigger widespread disaster. A culture of openness would render small scale clandestine projects harder to conceal but it would be hard to stop such a threat from growing. Certainly unless we can reduce the blatant inequities that fuel the grievances of the disaffected. We need to redirect technology in environmentally benign

directions. We need to ensure that globalisation doesn't just benefit the rich countries. Aiming at this worthy goal for the wrong reason is better than not aiming at it all. Thank you.